

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
24 July 2003 (24.07.2003)

PCT

(10) International Publication Number
WO 2003/061123 A3

(51) International Patent Classification⁷: **H02M 7/48**

Hanningfield Road, Great Baddow, Chelmsford CM2 8HN (GB).

(21) International Application Number:
PCT/GB2002/005734

(74) Agent: BAE SYSTEMS PLC; Group IP Department, P.O. Box 87, Lancaster House, Farnborough Aerospace Centre, Farnborough, Hampshire GU14 6YU (GB).

(22) International Filing Date:
17 December 2002 (17.12.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0200030.5 2 January 2002 (02.01.2002) GB

(71) Applicant (for all designated States except US): BAE SYSTEMS PLC [GB/GB]; 6 Carlton Gardens, London SW1Y 5AD (GB).

(72) Inventor; and

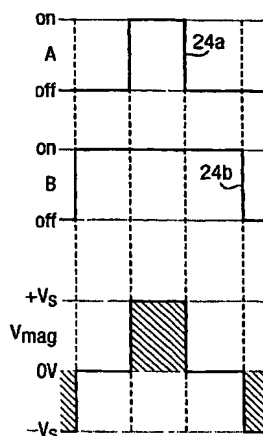
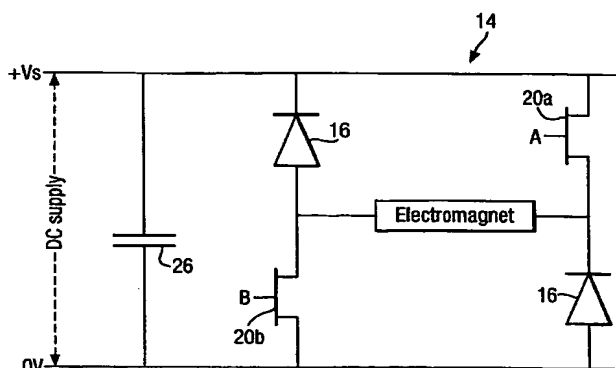
(75) Inventor/Applicant (for US only): WESTCOTT, Andrew, Mark, Graham [GB/GB]; Bae Systems ATC, West

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SI, SK,

[Continued on next page]

(54) Title: A SWITCHING CIRCUIT AND A METHOD OF OPERATION THEREOF



(57) Abstract: This invention relates to the operation of a switching circuit, such as a bridge circuit. The invention provides a method of generating pulsed first and second switching signals for switching first and second switches of a switching circuit further comprising an output and that receives a DC signal of voltage $+V_s$, wherein switching of the first and second switches produces voltage pulses of $+V_s$, 0V and $-V_s$ at the output; the method comprising the steps of: receiving a voltage demand signal; and generating the first and second switching signals according to a rule that the first switching signal shall have a single pulse of a first determined width and the second switching signal shall remain in one state, the combination of the first and second switching signals producing an average voltage at the output being substantially equal to the demanded voltage.

WO 2004/061123 A3



TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(88) Date of publication of the international search report:

24 June 2004

Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International Publication No.
PCT/GB 05734

10/500638

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H02M7/48

Rec'd PCT/PTO 02 JUL 2004

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H02M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 00/74222 A (HITACHI) 7 December 2000 (2000-12-07) abstract figures 1,2,5	1,2,9, 13,15
X	EP 0 760 552 A (SGS-THOMSON) 5 March 1997 (1997-03-05) figures 1,4b	1,2,9, 13,15
A	PATENT ABSTRACTS OF JAPAN vol. 018, no. 343, 28 June 1994 (1994-06-28) & JP 06 083402 A (TOSHIBA CORP.), 25 March 1994 (1994-03-25) abstract figure 6b	1
	----- -/-	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

13 January 2004

Date of mailing of the international search report

08 APR 2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Lund, M

INTERNATIONAL SEARCH REPORT

International Publication No

PCT/GB/05734

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 98/39787 A (MANNESMANN REXROTH AG) 11 September 1998 (1998-09-11) page 6, line 32 - page 8, line 9 figure 2	1
A	----- US 4 768 141 A (GUIDO HUBERTUS ET AL.) 30 August 1988 (1988-08-30) abstract figures 3,4 -----	1

INTERNATIONAL SEARCH REPORT

International application No.
GB 02/05734

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-5,9,13,15

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

Continuation of Box I.2

Claims Nos.:

Claim 16: When a transistor is switched off substantially a minimum current (the leakage current) is flowing through it. But, when a transistor is switched on the circuit to which it is connected is to a large extent determining the current and the current cannot be said to be a ?maximum current flow?. A part of this claim is trivial the rest lacks clarity and cannot be subject to search.

Claims 30-32: The special technical features of each claim must clearly be specified by the applicant. It is not the task of anyone else to identify a patentable combination of such features.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.5), should the problems which led to the Article 17(2) declaration be overcome.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB02/05734

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 0074222	A	07-12-2000	WO 0074222 A1	07-12-2000
EP 0760552	A	05-03-1997	EP 0760552 A1	05-03-1997
			DE 69523752 D1	13-12-2001
			DE 69523752 T2	29-08-2002
			JP 9121591 A	06-05-1997
			US 5917720 A	29-06-1999
JP 06083402	A	25-03-1994	NONE	
WO 9839787	A	11-09-1998	WO 9839787 A1	11-09-1998
			DE 19808297 A1	10-09-1998
			DE 59802955 D1	14-03-2002
			EP 0965140 A1	22-12-1999
US 4768141	A	30-08-1988	DE 3603071 A1	06-08-1987
			DE 3671140 D1	13-06-1990
			EP 0231481 A2	12-08-1987
			JP 62230369 A	09-10-1987